

AMENDMENT TO THE CLAIMS

1. (Currently Amended) A method of determining an estimate for a noise-reduced value representing a portion of a noise-reduced speech signal, the method comprising:

generating an alternative sensor signal using an alternative sensor other than an air conduction microphone;

converting the alternative sensor signal into at least one alternative sensor vector; and

adding a weighted sum of a plurality of correction vector-vectors to the alternative sensor vector to form the estimate for the noise-reduced value, wherein each correction vector corresponds to a mixture component and each weight applied to a correction vector is based on the probability of the correction vector's mixture component given the alternative sensor vector.

2. (Original) The method of claim 1 wherein generating an alternative sensor signal comprises using a bone conduction microphone to generate the alternative sensor signal.

3. (Canceled)

4. (Canceled)

5. (Original) The method of claim 1 further comprising training a correction vector through steps comprising:

generating an alternative sensor training signal;

converting the alternative sensor training signal into an alternative sensor training vector;

generating a clean air conduction microphone training signal;

converting the clean air conduction microphone training signal into an air conduction training vector; and

using the difference between the alternative sensor training vector and the air conduction training vector to form the correction vector.

6. (Currently Amended) The method of claim 5 wherein training a correction vector further comprises training a separate correction vector for each of the plurality of mixture components.

7. (Original) The method of claim 1 further comprising generating a refined estimate of a noise-reduced value through steps comprising:

generating an air conduction microphone signal;
converting the air conduction microphone signal into an air conduction vector;
estimating a noise value;
subtracting the noise value from the air conduction vector to form an air conduction estimate;
combining the air conduction estimate and the estimate for the noise-reduced value to form the refined estimate for the noise-reduced value.

8. (Original) The method of claim 7 wherein combining the air conduction estimate and the estimate for the noise-reduced value comprises combining the air conduction estimate and the estimate for the noise-reduced value in the power spectrum domain.

9. (Original) The method of claim 8 further comprising using the refined estimate for the noise-reduced value to form a filter.

10. (Original) The method of claim 1 wherein forming the estimate for the noise-reduced value comprises forming the estimate without estimating noise.

11. (Original) The method of claim 1 further comprising:

generating a second alternative sensor signal using a second alternative sensor other than an air conduction microphone;

converting the second alternative sensor signal into at least one second alternative sensor vector;

adding a correction vector to the second alternative sensor vector to form a second estimate for the noise-reduced value; and

combining the estimate for the noise-reduced value with the second estimate for the noise-reduced value to form a refined estimate for the noise-reduced value.

12. (Currently Amended) A method of determining an estimate of a clean speech value, the method comprising:

receiving an alternative sensor signal from a sensor other than an air conduction microphone;

receiving an air conduction microphone signal from an air conduction microphone;

identifying a pitch for a speech signal based on the alternative sensor signal;

using the pitch to decompose the air conduction microphone signal into a harmonic component and a residual component by modeling the harmonic component as a sum of sinusoids that are harmonically related to the pitch;

and

using the harmonic component and the residual component to estimate the clean speech value by determining a weighted sum of the harmonic component and the residual component.

13. (Original) The method of claim 12 wherein receiving an alternative sensor signal comprises receiving an alternative sensor signal from a bone conduction microphone.

14. (Currently Amended) A computer-readable storage medium storing~~having~~ computer-executable instructions for performing steps comprising:

receiving an alternative sensor signal from an alternative sensor that is not an air conduction microphone; and

receiving a noisy test signal from an air conductive microphone;

generating a noise model from the noisy test signal, the noise model comprising a mean and a variance;

converting the noisy test signal into at least one noisy test vector;

subtracting the mean of the noise model from the noisy test vector to form a difference;

forming an alternative sensor vector from the alternative sensor signal;

adding a correction vector to the alternative sensor vector to form an alternative sensor estimate of a clean speech value; and

setting a weighted sum of the difference and the alternative sensor estimate as an estimate of the clean speech value

~~using the alternative sensor signal to estimate a clean speech value without using a model trained from noisy training data collected from an air conduction microphone.~~

15. (Currently Amended) The computer-readable storage medium of claim 14 wherein receiving an alternative sensor signal comprises receiving a sensor signal from a bone conduction microphone.

16. (Canceled)

17. (Currently Amended) The computer-readable storage medium of claim 14~~16~~ wherein adding a correction vector comprises adding a weighted sum of a plurality of correction vectors, each correction vector being associated with a separate mixture component.

18. (Currently Amended) The computer-readable storage medium of claim 17 wherein adding a weighted sum of a plurality of correction vectors comprises using a weight that is based on the probability of a mixture component given the alternative sensor vector.

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

23. (Currently Amended) The computer-readable storage medium of claim 1422 wherein the estimate of the clean speech value is in the power spectrum domain.

24. (Currently Amended) The computer-readable storage medium of claim 23 further comprising using the estimate of the clean speech value to form a filter.

25. (Canceled)

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Currently Amended) The computer-readable storage medium of claim 14 further comprising:

receiving a second alternative sensor signal from a second alternative sensor that is not an air conduction microphone; and
using the second alternative sensor signal with the alternative sensor signal to estimate the clean speech value.

30. (New) The computer-readable storage medium of claim 14 wherein the weighted sum is computed by forming a weight based on the variance of the noise model.